



West Lake Landfill Vicinity

Radiological Survey and Sampling

November 4-6, 2015

Interim Report



Hazardous Waste Program
Federal Facilities Section
January, 2016



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

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1.0 Introduction

On November 4 through November 6, 2015 the Missouri Department of Natural Resources (DNR) and Missouri Department of Health and Senior Services (DHSS) performed radiological surveys and sampling at locations in the vicinity of West Lake Landfill (site). The Environmental Protection Agency (EPA) also assisted in this event, providing additional equipment and staff. Sampling activities were conducted in publically accessible and private property areas near the perimeter of the site, as well as near residential areas, to determine if there is evidence of potential current exposures to the public. Activities covered in this interim report are similar to activities performed by DNR in 2013. Where practical, the DNR performed gamma surveys to support selection of soil and sediment sampling at nine locations. Additionally, surface water sampling was performed at one location and settled dust swipe samples were collected at six locations. All dust swipe samples were analyzed using a bench top meter at the DNR Florissant Field Office. Two of these samples along with all soil, sediment, and water samples were sent to the Eberline Services laboratory for further analysis.

This report provides an interim update on this effort, identifies the selected sampling locations, details the radiological survey methods, and documents initial results. Final conclusions and laboratory analytical results from soil, sediment, surface water and selected dust samples will be presented in a final report after those results are validated. In a joint effort, the DHSS performed radiological air sampling and will present their results separately from this report. All results are being shared with EPA. Although the purpose of the field screening was to provide a biased sample collection location and identify any areas that may require further evaluation, we do note field screening observations did not identify any areas of health and safety concern for staff.

2.0 Site Description

The West Lake Landfill site is located on a parcel of approximately 200 acres within the city limits of Bridgeton, Missouri and was listed on the National Priorities List (NPL) in 1990 by EPA (Figure 1). The site consists of the Bridgeton Sanitary Landfill, which stopped receiving waste on December 31, 2004 and several old inactive areas with municipal solid waste and demolition debris. The site is divided into two Operable Units (OUs). OU-1 consists of radiological areas (Area 1 and Area 2) and OU-2 consists of the other landfill areas, which are not known to be impacted by radionuclide contaminants.

The site is located approximately one mile north of the Interstate-70/270 interchange. The Missouri River lies approximately 2 miles north and west of the landfill and Lambert International Airport lies approximately 2 miles to the east-southeast. St. Charles Rock Road defines much of the eastern boundary of the site, with Boenker Lane/Old Saint Charles Road marking the southern and western boundaries.

3.0 Procedures and Results

Preliminary sampling locations and areas of interest were selected during a field reconnaissance performed on October 20, 2015 and discussed in the November 2015 Radiological Survey and Sampling Plan. Selection of sampling areas was generally based on visual examination of the overall site's geographic layout with consideration given to:

- Historic sampling efforts;
- Prevailing wind direction at the site;
- Water drainage patterns;
- Evidence of erosion or sediment deposition; and
- Proximity to residential communities

This interim report provides details of field measurement findings, methods and equipment. Field logs of each sample location are available in Appendix D. Field notes were also taken and are available in Appendix F. A final report will be made available after laboratory-obtained results are validated.

Sampling and surveying was performed by four DNR personnel in groups of two. Where practical, specific soil samples taken from the sampling locations identified in Figure 1 were collected based on any noted fluctuations in the radiological surveying equipment. The ultimate soil sample collected therefore came from any location exhibiting the highest readings in any one area and thus biased the sampling as based on the field screening results. Recorded weather data during the sampling event was either estimated based on hourly meteorological data provided by the DNR station located off of St. Charles Rock Road to the east of the site, or local data reported from a weather mobile phone application. Hourly meteorological data has been included in Appendix E.

Environmental media that were sampled and analyzed includes surface soil and sediment from zero to six inches below ground surface, surface water, and settled dust. Laboratory testing for soil and sediment include the following radionuclides of interest: Uranium-234 (U-234); U-235; U-238; Thorium-228 (Th-228); Th-230; Th-232; Radium-226 (Ra-226); Ra-228; and Lead 210 (Pb-210). Levels of Gross Alpha, Gross Beta and Gamma radiation were also examined. Laboratory testing for water samples includes total U, Ra-226, Ra-228, Gross Alpha, and Gross Beta. Field and office equipment were used to collect measurements of Alpha, Beta, and Gamma radiation. All radionuclides of interest are naturally occurring and will be present at low levels in the environment. Equipment used for field measurements are summarized below.

3.1 Equipment Description

The equipment used for field measurements during this event is summarized below. Each item has been given a letter identifier which will be referred to for the remainder of this report. Equipment operation checks were performed consistent with standard operating procedures and numerous response verification checks were made during the sampling effort.

Sampling equipment and tools were decontaminated consistent with standard operating procedures. Additional details on each piece of equipment are provided in Appendix C.

Equipment A: Ludlum model 2221 with 43-5 ZnS Scintillator detector - For this event, the meter was read as an instantaneous rate to search for hotspots, and scan personnel at the end of daily sampling activities. Cumulative counts for 1 minute were taken when instantaneous readings detected any activity.

Equipment B: Ludlum model 2221 with 44-10 NaI Gamma Scintillator detector - The meter was utilized to collect instantaneous gamma readings of larger areas (gamma surveys) where practical in order to identify locations with values in the higher range of each area. One-minute readings of each identified location were then collected in order to select each soil and sediment sample location.

Equipment D: The Ludlum model 19A μ R meter probe was utilized for gamma surveys where soil and dust swipe samples were collected. The instrument was held horizontally near waist height. The instrument was preset to alarm at a reading of 50 μ R/hr, which represents an approximate annual exposure rate of 0.438 REM.

Equipment E: Ludlum model 2929 with 43-10-1 swipe counter - This bench top meter was used to perform alpha counts and combined beta-gamma counts of dust swipe samples. A Thorium 230 check source was periodically used to confirm equipment response.

EPA Equipment Y: Ludlum model 2221 with 44-20 NaI Gamma Scintillator detector – This field equipment was brought by and periodically used by EPA personnel at some sampling locations(Photograph 1.)

EPA Equipment Z: Ludlum model 3030 with ZnS (Ag) Scintillator detector and shielded 2-inch sample tray – This bench top meter and probe is owned by EPA and was used for simultaneous alpha and beta sample counts of selected dust swipe samples. Readings are in CPM for alpha and combined beta gamma.

3.2 Radiological Field Surveys

Procedure: Equipment B and D were utilized to obtain instantaneous gamma readings for an overall assessment of the range of gamma activities at all sample areas identified in Figures 1 through 6, except sample location S03 and S06 due to the dense vegetation present in those areas. Some areas were scanned several times during this sampling event. Photograph 2 shows a gamma survey being conducted at Spanish Village Park.

Results: Screening values revealed the vast majority of readings in each area fell in the lower range of the detected values for gamma radiation, with brief fluctuations to comparatively higher values. Higher readings were used to determine exact soil sample locations to promote a biased sample be collected. Although the primary purpose of the

field screening was to provide a biased sample collection location, we do note field screening observations did not identify any areas of health and safety concern for staff. However, soil sample locations S02, located on or immediately adjacent to restricted private property to the north, and S10, located on or immediately adjacent to restricted private property northwest of Area 2, had some limited areas of persistent readings approximately 20% to 30% higher than other readings within the same area. We note the sample locations may still be on site property, as they were at the unmarked perimeter of the facility and neighboring private property. Forthcoming laboratory sample analyses will verify any specific concentrations in those samples and determine the need for any further evaluation.

3.3 Surface Soil and Sediment

Procedure: Equipment B and D were utilized to take area-wide instantaneous gamma readings of each soil sample location where practical. Locations that had gamma readings in the higher end of each area range were then flagged for 1-minute gamma measurements using Equipment B. Up to five 1-minute measurements were taken and the location with the highest measurement was selected to collect the soil samples.

Surface soil and sediment samples were collected using a slide hammer and split spoon sampler fitted with a plastic sleeve. The resulting sample, encased in a 2-inch diameter by 6-inch long plastic sleeve, were sealed on each end with a plastic cap then taped. (Photographs 3 - 5)

Results: No difficulties were encountered with the field measuring or sampling tools. Of the areas selected for soil sampling, locations S09 and S10 (Figure 2) were substantially moved from the original location selected during field reconnaissance. The appearance of sediment accumulation conditions at the new S09 location provided a biased sample opportunity. Sample location S10 was moved due to the presence of a thick asphalt cap, with the final location selected based on the gamma survey field screening.

As noted in Section 3.2, two sample locations S02 and S10 exhibited limited areas of persistent gamma readings. For sample location S02 located north of Area 2, we note that soil in this area appeared to contain notable crushed red brick debris which may have contributed to the comparatively more elevated gamma readings, so an additional more segregated sample (S02B) was collected in an effort to determine the elevated gamma reading source. These sample locations may still be on site property, as they were at the perimeter of the facility and neighboring private property. All samples, including a quality control duplicate sample S02C, were sent for laboratory analysis, and results will be available in the final report.

3.4 Surface Water

Procedure: One surface water sample and one duplicate quality control sample was collected into 4-liter cubitainers for laboratory analysis. Photograph 6 shows some of the samples being prepared for delivery.

Results: The water samples were obtained in the wooded area southwest of the site where water had collected during the rain event. No problems were encountered during sampling. Samples were sent for laboratory analysis, and results will be available in the final report.

3.5 Settled Dust

Procedure: Dust swipe samples were obtained at each selected area using standard cloth swipes. A preliminary alpha scan of each swipe was performed using Equipment A prior to analyzing the swipe samples on Equipment E for 10-minute count duration alpha and beta plus gamma counts. Samples that showed variable results from Equipment E were analyzed several times and all results are listed in Table 1. Quality assurance data is provided in Table 2. Photographs 7 and 8 show examples of dust sample collection and measurement.

Results: Consistent with similar dust screening conducted by the DNR on May 16, 2013, results did not yield areas of interest, with the potential exception of dust swipe sample D07A, which is located on landfill fencing along the previously referenced private property northwest of Area 2. As part of the evaluation process, all samples were compared to empty tray (blank sample) alpha and beta plus gamma values. EPA assisted DNR in this dust analyses effort, allowing some samples to be taken to EPA's local office for additional testing on November 16 using EPA Equipment Z. The EPA results are presented in Table 3.

Dust sample D07A was taken from a sign on the landfill facility perimeter fence in the area of the previously discussed soil samples S09 and S10. We note this sample was on the site's fence, but the location is accessible via the adjacent private property. This swipe sample was analyzed four times with results indicating consistent, non-decreasing alpha counts ranging approximately 2.5 to 3.5 times greater than empty tray readings, along with a higher beta and gamma value as shown on Table 1. This sample was sent to the Eberline Services laboratory for Gross Alpha and Gross Beta analyses, with the possibility of additional analyses pending those results. All laboratory data will be presented in the final report.

There were also some variations noted with dust sample D05A, which was located to the immediate south of the facility and was analyzed four times with notably decreasing alpha values approaching empty tray levels, as seen on Table 1. This variability was not observed at any other locations and could be attributable to weather conditions on the day

of analyses. EPA analyses of this swipe sample indicated readings equivalent to empty tray counts. Given the variations associated with this sample, it was sent to the Eberline Services laboratory for analyses of Gross Alpha and Gross Beta, with the possibility of additional testing pending those results. All laboratory data will be presented in the final report.

Table 1 Dust Sample Testing Results using Equipment A & E

Results for preliminary alpha scans using equipment A and for alpha and beta plus gamma using equipment E for dust swipe samples

Sample Location Description	Sample ID	Preliminary Alpha Result (CPM)	10-Minute Alpha Result (Total Count)	10-Minute Beta + Gamma Result (Total Count)
First equipment check was performed (see Table 2) prior to the following samples				
Spanish Village Park: Pavilion Rafter	D04A	0	4	431
Spanish Village Park: Upper Jungle Gym Slide Bay Floor	D04B	0	2	445
Spanish Village Park: Bathroom Air Inlet	D04C	0	4	432
Home on hill: Picnic Bench	D03A	0	2	443
Home on hill: Piano	D03B	0	2	400
MSD Lift Station: Top of Control Panel (tested three times)	D05A	0, 0, 0	12, 7, 6	431, 417, 437
Second equipment check was performed (see Table 2) prior to the following samples				
DNR Emergency Response Trailer (EER): Roof under AC Canopy	D01E	0	5	423
MSD Lift Station: Air Monitoring Station	D05B	0	4	421
MSD Lift Station: Road surface near entrance	D05C	0	3	428
MSD Lift Station: Levy Gate	D05D	0	3	430
DNR EER Trailer: Floor	D01C	0	4	416
DNR EER Trailer: Oven exhaust hood	D01A	0	4	436
DNR EER Trailer: Printer shelf	D01B	0	2	433
AAA Trailer: Radiation Warning Sign on fence (tested three times)	D07A	0, 0, 0	13, 18, 16	473, 439, 423
Third equipment check was performed (see Table 2) prior to the following samples				
DNR EER Trailer: Furnace Air Intake	D01D	0	6	438
Abandoned Gas Station Canopy Downspout: Sample 1 of 2	D02A-1	0	4	456
Abandoned Gas Station Canopy	D02A-2	0	3	394

Downspout: Sample 2 of 2				
Abandoned Gas Station: Trash can	D02B	0	3	419
MSD Lift Station: Top of Control Panel (4)	D05A	0	5	452
AAA Trailer: Radiation Warning Sign on fence (4)	D07A	0	17	474
Final equipment check was performed (see Table 2) to confirm equipment response				
Total counts may be converted to CPM by dividing the total count value by 10 Testing performed on November 5, 2015				

Table 2 Equipment E Performance Checks

Periodic testing using 1) a known radioactive source material and 2) an empty tray were performed to confirm equipment response.

Equipment Check Description and Time	10-Minute Alpha Result (Total Count)	10-Minute Beta + Gamma Result (Total Count)
First Equipment Check		
06:47 Empty Tray	2	416
07:00 Th-230 Check Source	9414	1764
Second Equipment Check		
09:28 Empty Tray(1)	3	394
09:49 Empty Tray(2)	5	411
10:00 Empty Tray(3)	0	417
10:13 Th-230 Check Source	9414	1783
Third Equipment Check		
14:09 Empty Tray(1)	2	423
14:25 Empty Tray(2)	2	407
14:36 Empty Tray(3)	3	413
14:47 Th-230 Check Source	9393	1741
Final Equipment Check		
19:04 Th-230 Check Source(1)	9601	1729
19:43 Th-230 Check Source(2)	9476	1715
19:56 Th-230 Check Source(3)	9402	1856
20:09 Empty Tray	3	427
Total counts may be converted to CPM by dividing the total count value by 10 Testing performed on November 5, 2015		

Table 3 Dust Sample Test Results using EPA Equipment Z

Select dust swipe samples were brought to the local EPA office for additional analysis.

Equipment Check	10 Minute Alpha Result (average CPM)	10 Minute Beta + Gamma Result (average CPM)
Equipment Check using Th230 (α) Check Source	3291 ^A	*
Equipment Check using Sr90 (β) Check Source	*	1198 ^A
Equipment Check with an Empty Tray	0	42
Sample ID	10 Minute Alpha Result (average CPM)	10 Minute Beta + Gamma Result (average CPM)
D04A	0	45
D01D	0	43
D05A	0	43
D07A	1	48
^A One minute counts		
Equipment Checks and Testing completed between 12:30 and 14:15 on November 16, 2015		

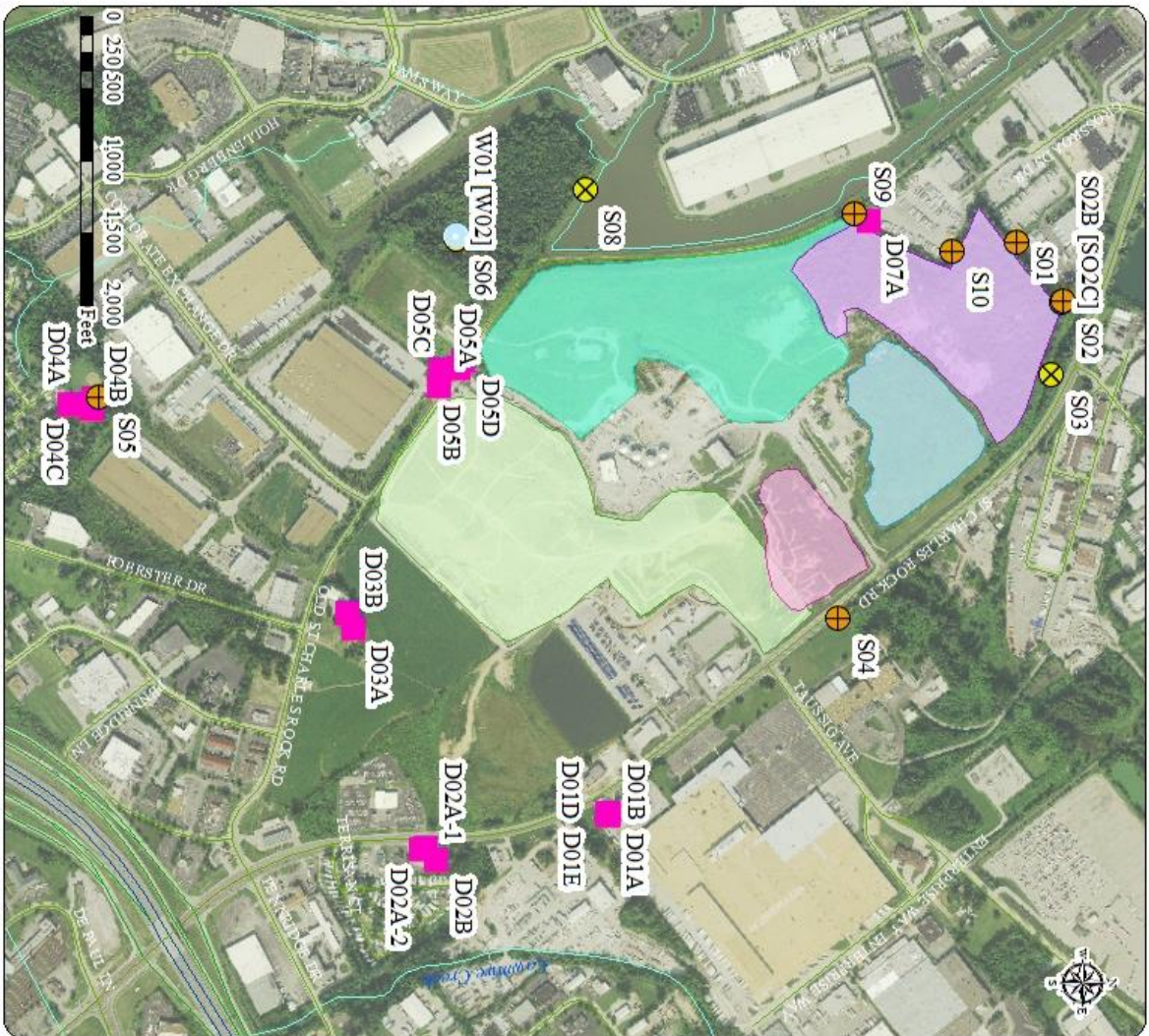
4.0 Conclusion

This interim report provides an update on a West Lake Landfill vicinity radiological survey and sampling effort conducted by DNR on November 4 through November 6, 2015. As part of this effort, the DNR and DHSS, with supporting participation from EPA, performed radiological surveys and sampling at numerous locations in the vicinity of West Lake Landfill. This interim report discusses real-time screening methods and data collected in the field that was used to select soil, sediment, dust and surface water samples which were sent for laboratory analyses. That data will be included and discussed in the DNR's final report.

Overall, the vast majority of readings in each area fell in the lower range of values for gamma radiation, with brief fluctuations to comparatively higher values. Higher readings were used to determine exact soil sample locations to promote collection of a biased sample. Although the purpose of the field screening was to provide a biased sample collection location, we do note field screening observations did not identify any areas of health and safety concern for staff. However, two soil sample locations, located on or immediately adjacent to private property north and northwest of Area 2, had areas of persistent readings comparatively higher than other detections in those areas. In that same general location, a dust swipe sample on site fencing exhibited consistent readings comparatively higher than empty tray counts. No formal conclusions regarding these areas can be drawn until laboratory results are received and reviewed. We also note that access is very limited due to adjacent private property, signage, and/or fencing.

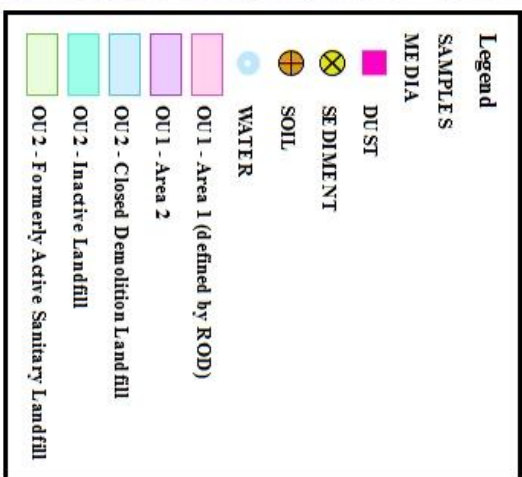
DNR has communicated all information to EPA and will share all laboratory data after it is received and quality assured. Consistent with other reports, this interim report and final report (when completed) will be posted on-line at the DNR's website. The DHSS radiological air sampling results will be presented in a separate report.

Appendix A: Figures



West Lake Landfill Vicinity

Sampling Locations Nov. 2015



Operable Unit 1 = Radiological Area
Operable Unit 2 = Nonradiological Area
Note: Boundaries are approximate and subject to change.



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Figure 1: Map of Sampling Locations

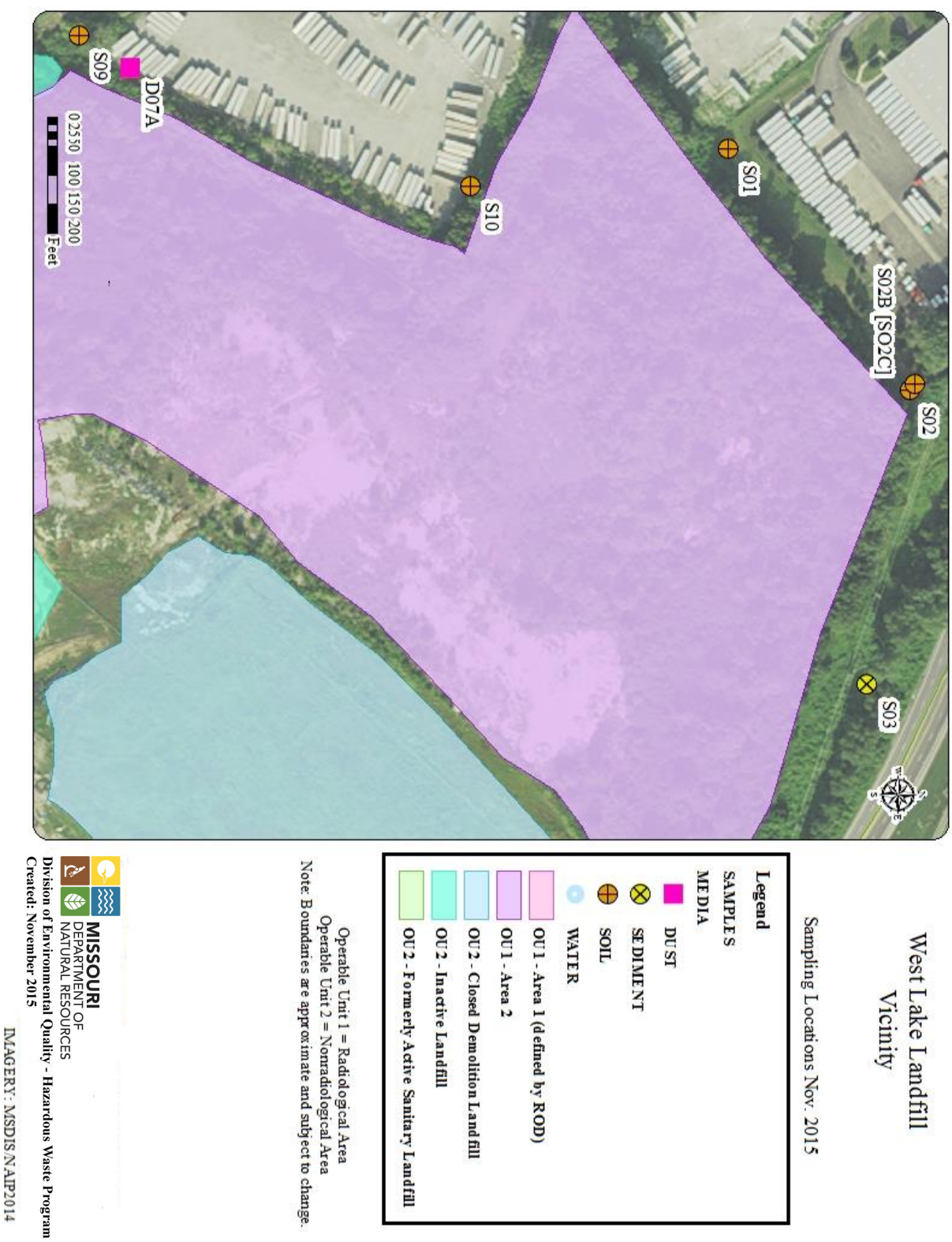
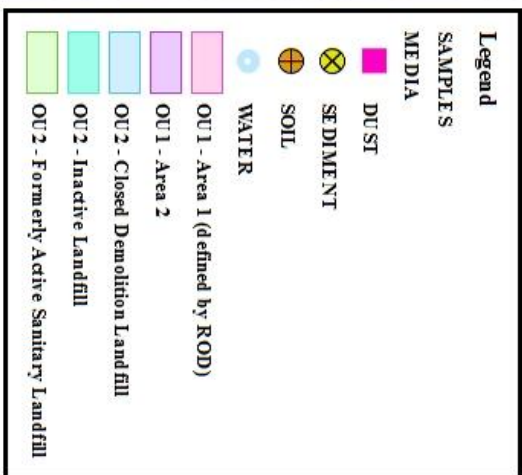


Figure 2: Sampling Locations North of Area 2



West Lake Landfill Vicinity

Sampling Locations Nov. 2015



Operable Unit 1 = Radiological Area
Operable Unit 2 = Nonradiological Area
Note: Boundaries are approximate and subject to change.

Figure 3: Sampling Locations Southeast of Area 1

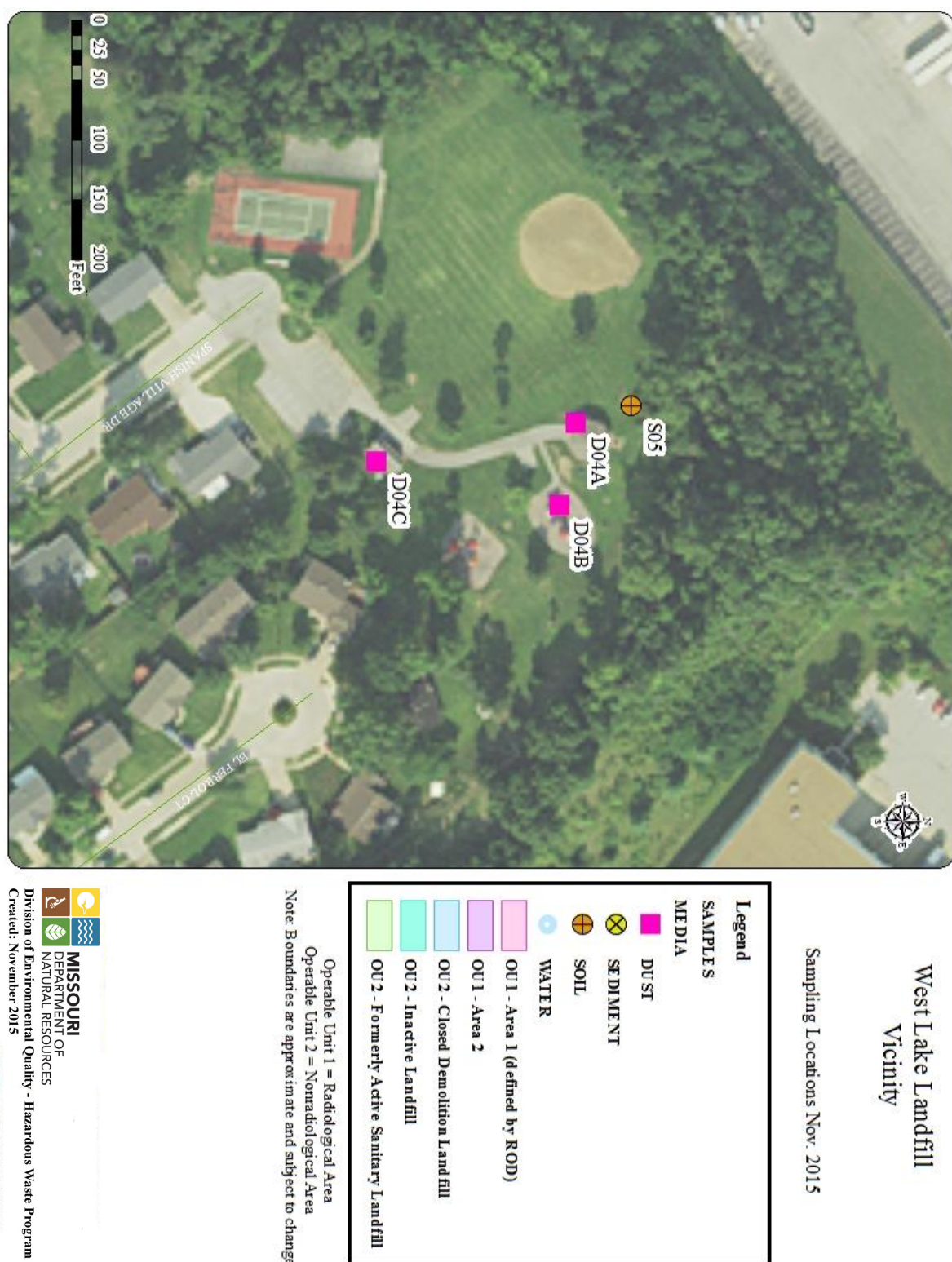
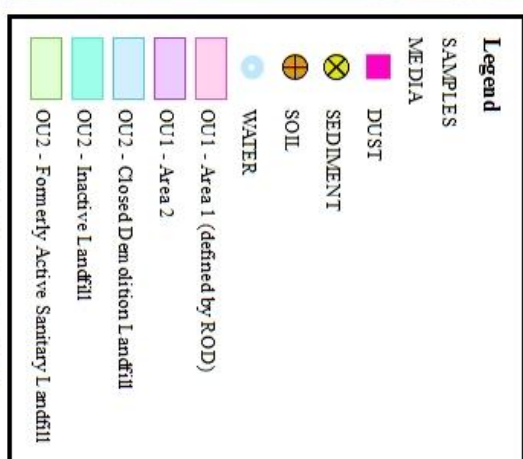


Figure 4: Sampling locations at Spanish Village Park south of WLL



West Lake Landfill Vicinity

Sampling Locations Nov. 2015



Operable Unit 1 = Radiological Area
Operable Unit 2 = Nonradiological Area
Note: Boundaries are approximate and subject to change.

Figure 5: Additional Sampling Locations South of West Lake Landfill

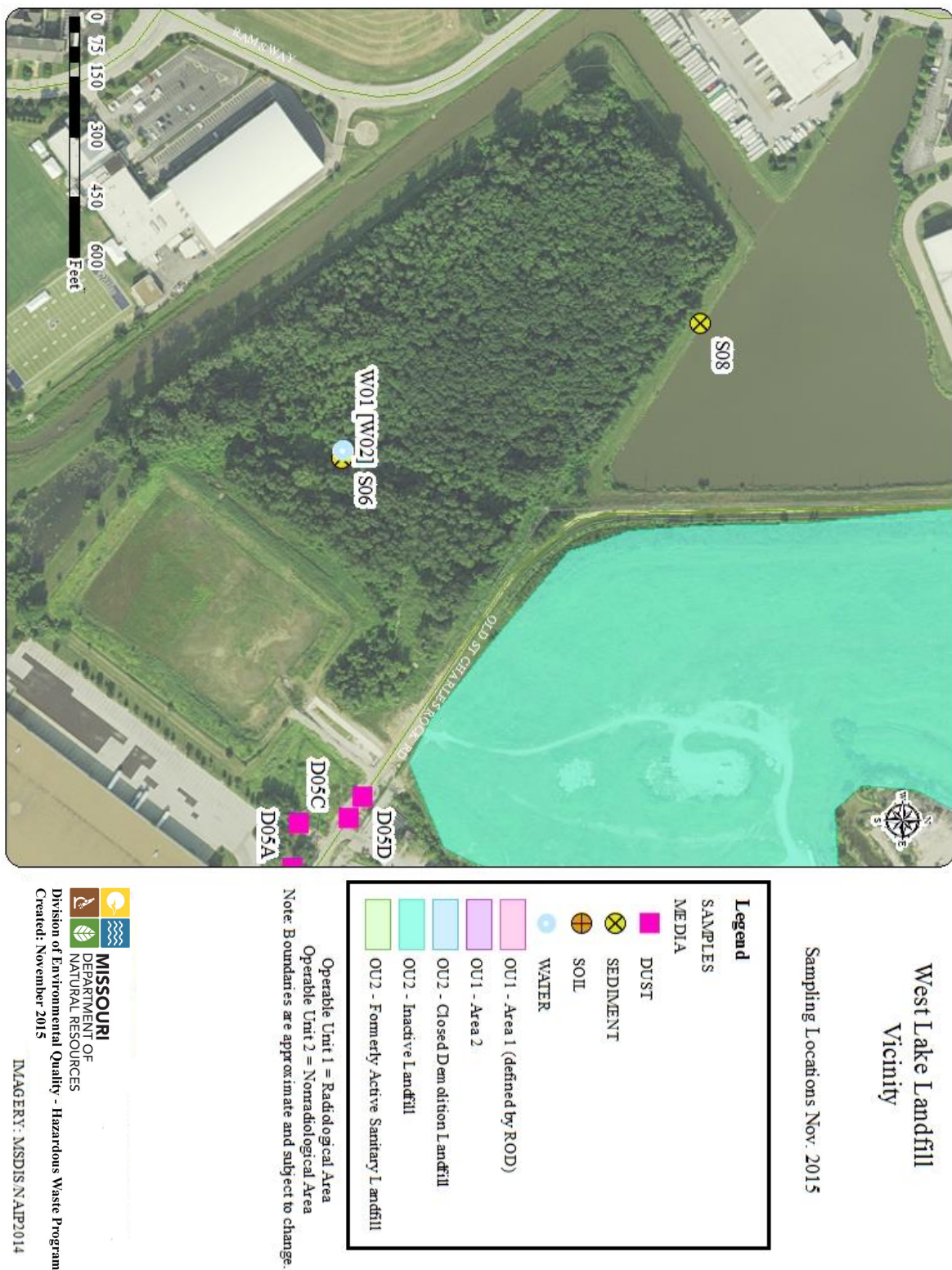


Figure 6: Sampling Location in Wooded Area South of West Lake Landfill

Appendix B: Photograph Log



Photograph 1: EPA Ludlum 2221 with NaI 44-20 detector and directional shield attachment (EPA Equipment Y)



Photograph 2: Gamma walkover survey conducted at Spanish Village Park



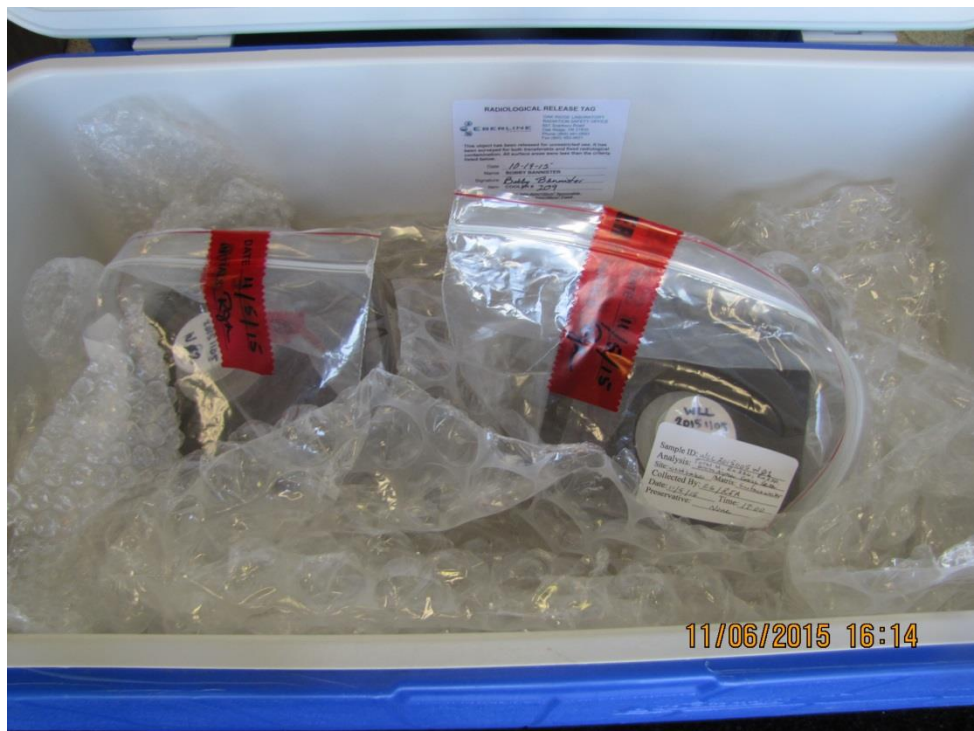
Photograph 3: One minute count being conducted on equipment B following gamma survey of immediate area. These locations are flagged in preparation of final soil sample location S09



Photograph 4: Soil sampling with Split Spoon sampler



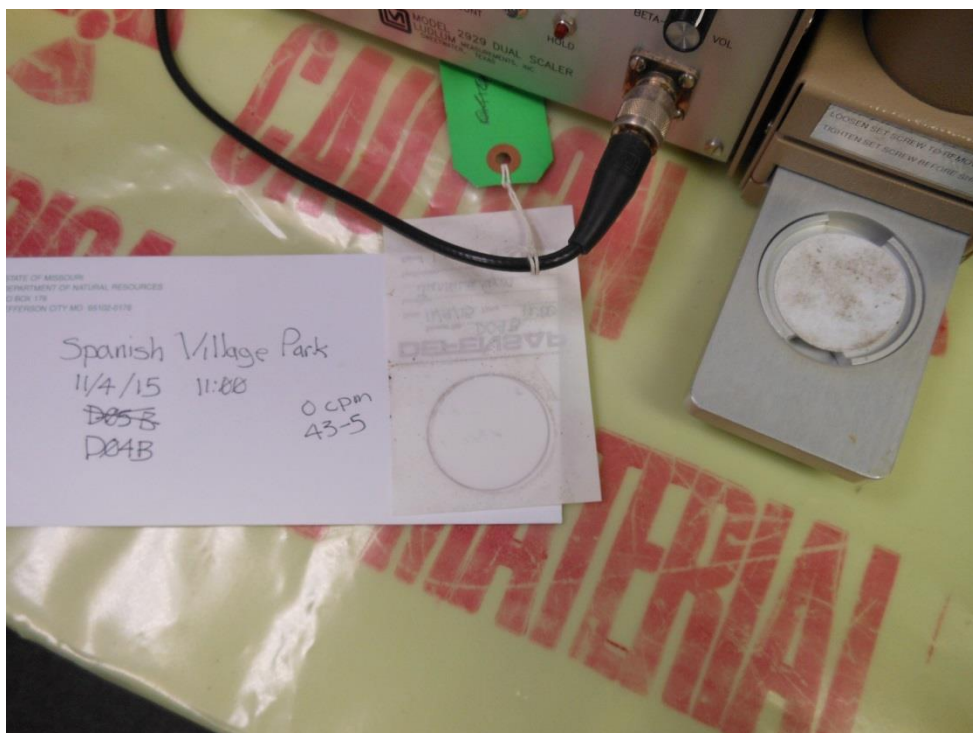
Photograph 5: Soil and sediment samples collected on November 4, 2015 being prepared for shipment



Photograph 6: Surface water samples being prepared for shipment



Photograph 7: Collection of dust swipe sample D02A



Photograph 8: Testing of Dust Swipe Sample D04B with Equipment E

Appendix C: Radiological Field Equipment

Equipment A: Ludlum model 2221 with 43-5 ZnS Scintillator detector - The meter has both digital and analog scales, is able to provide both instantaneous rates and accumulative counts over a user set time, and has field adjustable voltage settings to give the user some flexibility in selection of probes and focusing on feedback at different energy levels to help evaluate readings. The 43-5 ZnS detector is an alpha radiation detector that requires very close proximity to the surface of the object being surveyed.

Equipment B: Ludlum model 2221 with 44-10 NaI Gamma Scintillator detector - The meter has both digital and analog scales, and is able to provide both instantaneous rates and cumulative counts over a user set time. The meter also has field adjustable voltage settings to give the user some flexibility in selection of probes and focusing on feedback at different energy levels to help evaluate readings. The 44-10 detector is a Sodium Iodide (NaI) gamma radiation detector that combines high sensitivity and fast response.

Equipment D: Ludlum model 19A μ R meter - This meter with built-in detector has a fixed logarithmic analog scale and can only give feedback as a rate in units of micro-roentgen per hour (μ R/hr). It is meant to give fast and easy dose estimates in areas of low activity levels and to provide an alarm as activity begins to approach a preset action level. The instrument needle is constantly moving in response to activity such that visual precision is several μ R/hr. Results are most easily presented as a range.

Equipment E: Ludlum model 2929 with 43-10-1 swipe counter - This is a bench top meter and probe designed for counting swipe samples. These samples are small cloth patches used to retrieve dust. Readings are in total counts for alpha and combined beta gamma so readings need to be divided by the duration of the count in minutes for a CPM value.

EPA Equipment Y: Ludlum model 2221 with 44-20 NaI Gamma Scintillator detector – The 44-20 detector has higher detection sensitivity than Equipment B, making it well suited for survey applications (Photograph 1.)

EPA Equipment Z: Ludlum model 3030 with ZnS (Ag) Scintillator detector and shielded 2-inch sample tray – This was utilized as a bench top meter and probe used for simultaneous alpha and beta sample counting. Readings are in CPM for alpha and combined beta gamma.

Appendix D: Field Data Logs

D04

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 4, 2015 Arrival Time: 9:50 Departure Time: 11:30						
Team members/responsibilities: Ryan Seabaugh + Eric Gilstrap						
Weather (Description) Partly Cloudy	Temperature: 65°F	Humidity: 77%	Wind: (Direction and Speed) S @ 3 mph			
Radiation detection equipment used: model/serial number/calibration:						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:						
Reading:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:	11/4/15	11:00				11/5/15
Reading:	0CPM w/ SPORADIC OCCURRENCES OF SINGLE 1CPM (SLIDE)					0CPM SWIPES
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings: 8-10 uR/hr						
Sample Collection Log Information						
Sample location description: SPANISH VILLAGE PARK						
Odors Present: Yes or No			If Yes Please Describe:			
Collection equipment: DUST SWIPE, EXTENSION POLE						
Sampler's name(s): See Team Members						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	UTM(m) GPS Coord. 15s	Analytes Requested & Preservative if used
WLL20151104D04A	11/4/15 10:30	GRAB	DUST	PAVILLION RAFTER	0721881 4292870 _T	COUNT α , β + γ w/ 2929
WLL20151104D04B	11/4/15 11:00	↓	↓	JUNGLE GYM	0721902 4292866 _T	↓
WLL20151104D04C	11/4/15 11:10	↓	↓	R.R AIR INTAKE	0721891 4292819 _T	↓

Sample Event Log Information							
Project : West Lake Landfill Vicinity Sampling Event							
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015							
Purpose: Sample and Data Collection							
Date: November 4, 2015		Arrival Time: 12:50		Departure Time: 13:28			
Team members/responsibilities: Ryan Seabaugh + Eric Gilstrap							
Weather (Description) Partly Cloudy		Temperature: 70 F		Humidity: 66 %		Wind: (Direction and Speed) S @ 2.7 mph	
Radiation detection equipment used: model/serial number/calibration:							
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015							
Time:							
Reading:							
<input checked="" type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015							
Time:		11/5/15					
Reading:		0 CPM SWIPES					
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015							
Range of Readings:		5-10 uR/hr					
Sample Collection Log Information							
Sample location description: MSD LIFT STATION + LEVEE GATE							
Odors Present: Yes or No		If Yes Please Describe: MODERATE					
Collection equipment: DUST SWIPE, EXTENSION POLE							
Sampler's name(s): See Team Members							
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	UTM (m) GPS Coord.	Analytes Requested & Preservative if used	
WLL20151104D05A	11/4/15 13:00	GRAB	DUST	MSD CONTROL PANEL	0721820 4293604	COUNT, B+8 w/ 2929	
WLL20151104D05B	11/4/15 13:15	↓	↓	EER AIR SAMPLER	0721854 4293600	↓	
WLL20151104D05C	11/4/15 13:20	↓	↓	ROAD	0721800 4293653	0721816 4293643	
WLL20151104D05D	11/4/15 13:25	↓	↓	LEVEE GATE	0721800 4293653	↓	

D03

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 4, 2015 Arrival Time: 13:28 Departure Time: 13:45						
Team members/responsibilities: Ryan Seabaugh + Eric Gilstrap						
Weather (Description) Partly Cloudy		Temperature: 71 F		Humidity: 64 %		Wind: (Direction and Speed) S @ 3 mph
Radiation detection equipment used: model/serial number/calibration:						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:						
Reading:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015 (SWIPES)						
Time:		11/5/15				
Reading:		0 cpm	each			
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings: 7-13 mR/hr						
Sample Collection Log Information						
Sample location description: HOUSE ON THE HILL						
Odors Present: Yes of No			If Yes Please Describe:			
Collection equipment: DUST SWIPE						
Sampler's name(s): See Team Members						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	UTM(m) GPS Coord.	Analytes Requested & Preservative if used
WLL20151104D03A	11/4/15 13:30	GRAB	DUST	PICNIC BENCH	0722364 42934206	COUNT α , β + γ w/ 2929
WLL20151104D03B	11/4/15 13:42	↓	↓	PIANO TOP	0722333 4293407m	↓

D02

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 4, 2015 Arrival Time: 13:50 Departure Time: 14:30						
Team members/responsibilities: Ryan Seabaugh + Eric Gilstrap						
Weather (Description) Partly Cloudy	Temperature: 72 F	Humidity: 65 %	Wind: (Direction and Speed) S @ 3.7 mph			
Radiation detection equipment used: model/serial number/calibration:						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time: _____						
Reading: _____						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time: 11/5/15						
Reading: 00CPM SWIPES						
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015 (TRASH BARREL)						
Range of Readings: 7-15 mR/hr						
Sample Collection Log Information						
Sample location description: St Charles Rock Road Abandoned Gas Station						
Odors Present: (Yes) or No		If Yes Please Describe: MILD				
Collection equipment: DUST SWIPE EXTENSION POLE						
Sampler's name(s): See Team Members						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	UTM (m) GPS Coord.	Analytes Requested & Preservative if used
WLL20151104D02A-1	11/4/15 14:05	GRAB	DUST	DOWN- SPOUT	0722830 4293574	COUNT α, β+γ w/ 2929
WLL20151104D02A-2	11/4/15 14:15	↓	↓	DOWN- SPOUT	SAME 0722832 4293564	↓
WLL20151104D02B	11/4/15 14:25	↓	↓	TRASH BARREL	0722854 4293595	↓

D01

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan:						
West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 4, 2015 Arrival Time: 14:40 Departure Time: 16:00						
Team members/responsibilities:						
Ryan Seabaugh + Eric Gilstrap						
Weather (Description)	Temperature:	Humidity:	Wind: (Direction and Speed)			
Partly Cloudy	70°F	67%	S @ 3.8 mph			
Radiation detection equipment used: model/serial number/calibration:						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:						
Reading:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:	11/5/15		11/4/15			
Reading:	0 CPM (SWIPES)		0 CPM w/ SPORADIC SINGLE COUNTS		1 CPM	
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015 (INTERIOR)						
Range of Readings: NA						
Sample Collection Log Information						
Sample location description:						
EER TRAILER						
Odors Present: Yes or (No) If Yes Please Describe:						
Collection equipment:						
DUST SWIPE, EXTENSION POLE						
Sampler's name(s):						
See Team Members						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
WLL20151104D01A	11/4/15 14:47	GRAB	DUST	TRAILER OVEN HOOD EXHAUST	0722760 4293958 M	COUNT α , β + γ w/ 2929
WLL20151104D01B	11/4/15 14:50			PRINTER SHELF	0722757 4293961 M	
WLL20151104D01C	11/4/15 14:55			FLOOR	0722759 4293961 M	
WLL20151104D01D	11/4/15 15:00			AIR INTAKE	0722757 4293958 M	
WLL20151104D01E	11/4/15 15:10			ROOF	0722758 4293957 M	

D0' f

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 4, 2015		Arrival Time: 16:10		Departure Time: 17:40		
Team members/responsibilities: Ryan Seabaugh + Eric Gilstrap - Left, then returned (site manager in a meeting)						
Weather (Description) Partly Cloudy	Temperature: 66°F	Humidity: 78%	Wind: (Direction and Speed) SE @ 2.4 mph			
Radiation detection equipment used: model/serial number/calibration:						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:						
Reading:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:	11/5/15					
Reading:	0 CPM	(SWIPES)				
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings: 8-15 mR/hr						
Sample Collection Log Information						
Sample location description: AAA TRAILER LOT - LOCATIONS APPROVED BY OWNER (EAST FENCE LINE)						
Odors Present: Yes or No		If Yes Please Describe: MILD				
Collection equipment: DUST SWIPE						
Sampler's name(s): See Team Members						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	UTM (m) GPS Coord.	Analytes Requested & Preservative if used
WLL20151104D07A	11/4/15 17:30	GRAB	DUST	SIGN	0721505 4294509g	COUNT α, β+γ w/ 2929

1 Facility manager in meeting. so we left to look @ other locations and then returned.

D08

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 4, 2015 Arrival Time: _____ Departure Time: _____						
Team members/responsibilities: Ryan Seabaugh + Eric Gilstrap						
Weather (Description)	Temperature: ____F		Humidity: ____%		Wind: (Direction and Speed) _____ @ _____ mph	
Radiation detection equipment used: model/serial number/calibration:						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time: _____						
Reading: _____						
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time: _____						
Reading: _____						
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings: _____						
Sample Collection Log Information						
Sample location description: NA Site Access not obtained.						
Odors Present: Yes or No			If Yes Please Describe:			
Collection equipment:						
Sampler's name(s):						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used

Sample Event Log Information							
Project : West Lake Landfill Vicinity Sampling Event							
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015							
Purpose: Sample and Data Collection							
Date: November 4, 2015 Arrival Time: 9:53 Departure Time: 11:30							
Team members/responsibilities: <div style="display: flex; justify-content: space-between;"> <div> Eric Gilstrap - 43-5 - Surveys Dan Carey - 2x2 Ryan Seabough - 19A </div> <div> Rita Alexander - Note, QC New present: Tom Fletcher, EPA </div> </div>							
Weather (Description) Cloudy		Temperature: 63°F		Humidity: 82%		Wind: (Direction and Speed) N @ 0 mph	
Radiation detection equipment used: model/serial number/calibration:							
<input checked="" type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015 Park Ranger (instantaneous) 5000 - 11000cpm							
Time:		9:58	10:07	10:15	10:21	10:28	10:43
1 Min - Reading: (cpm)		10,190	10,149	10,473	10,352	10,293	9,960
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015							
Time:		10:24	11:00	11:10			
Reading:		0 cpm	0 cpm	0 cpm			
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015							
Range of Readings: 10-15 nR/hr							
Sample Collection Log Information							
Sample location description: Spanish Village Park							
Odors Present: Yes or No		If Yes Please Describe: very mild possible sewer odor					
Collection equipment: Snipes + extension pole Shake Hammer, Split Spoon sampler with sleeve							
Sampler's name(s): Eric Gilstrap / Ryan Seabough - Surveys Dan Carey / Rita Alexander - soil sample							
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used	
WLL20151104505	11/4/15 11:10	Grab Soil	Soil	Brown, No odor		Ra 226, Ra 228, Th 230, Th 232, Gross Alpha, Gross Beta, None Pb 210	
Rita WLL D04A	11/4/15 10:21	Grab	snipe	Partition Refractors			
D04B	11/4/15 11:00	Grab	"	Partition Refractors Floor/Side Bay Wipe Sampled			
D04C	11/4/15 11:10	Grab	"	Partition Refractors Air intake			

Sample Event Log Information							
Project : West Lake Landfill Vicinity Sampling Event							
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015							
Purpose: Sample and Data Collection							
Date: November 4, 2015 Arrival Time: 12:50 Departure Time: 13:30							
Team members/responsibilities: Dan Carey - 2nd; sampling Rita Alexander observation, sampling							
Weather (Description) Cloudy		Temperature: 64°F		Humidity: 74%		Wind: (Direction and Speed) SSE @ 3 mph	
Radiation detection equipment used: model/serial number/calibration:							
<input checked="" type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015 8000-11000cpm							
Time:		12:57	13:00	13:03	13:05	13:08	13:10
Reading:		9589	9637	9729	9817	10287	8546
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015							
Time:							
Reading:							
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015							
Range of Readings:							
Sample Collection Log Information							
Sample location description: Arthur Trucking Back lot - Drainage - South corner							
Odors Present: Yes or <u>No</u>			If Yes Please Describe:				
Collection equipment: slide hammer Split Spoon sampler with sleeve							
Sampler's name(s): Dan Carey, Rita Alexander							
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used	
WLL20151104 - 501	11/4/15 13:15	Grab	Soil	Dark Brown No odor		Re 224, Re 228, Iso 11, Ino 14, Gross Alpha/Gross Beta, Pb 210 - 210 Po none.	

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 4, 2015 Arrival Time: 13:33 Departure Time: 14:25						
Team members/responsibilities: <div style="margin-left: 20px;"> Dan Carey: 2nd sampler Rita Alexander: observation, sampler </div>						
Weather (Description) Sunny - Pt. Cloudy		Temperature: 68 F		Humidity: 69 %		Wind: (Direction and Speed) SSE @ 5 mph
Radiation detection equipment used: model/serial number/calibration:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015 Range:						
Time:	13:36	13:38	13:40	13:45/13:51	13:55	13:50
Reading:	9748	10360	10749	Corner fence 14437	Corner fence 14158	12228
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings:						
Sample Collection Log Information						
Sample location description: <div style="margin-left: 20px;"> East corner of Air Truck Tractor lot Misc. Parking lot / construction debris in low area outside of parking lot A, S, G - Tall Grass Depressed Area East of A-7-BXCPN </div>						
Odors Present: (Yes) or No		If Yes Please Describe: Very faint - Possible transfer sta. odor - Bridge over LF				
Collection equipment: shale hammer Soil split spoon sampler with sieve						
Sampler's name(s): Dan Carey Rita Alexander						
Top Sample = 1 min scan - 8476 Bottom Sample = 8452						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
WL20151104 - 502	11/4/15 14:08	Grab	Soil	Top = 2" soil 3" - soil / Red brick frags.		Ra 224, Ra 226, Td 160 u, Tm 24, Gross Alpha, Gross Beta, Pb 210 No Preserv

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 4, 2015 Arrival Time: 15:56 Departure Time: 16:30						
Team members/responsibilities: Dan Carey - 2nd, sampler Rita Alexander, sampler, observations						
Weather (Description) Pt. Cloudy	Temperature: 69 F	Humidity: 67%	Wind: (Direction and Speed) SE @ 12 mph			
Radiation detection equipment used: model/serial number/calibration:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:	16:10					
Reading:	10577					
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings:						
Sample Collection Log Information						
Sample location description: After trucking Pk e corner - 2nd sample + Dup.						
Odors Present: Yes or No		If Yes Please Describe:				
Collection equipment: Slide hammer split spoon sampler with sleeve						
Sampler's name(s): Dan Carey Rita Alexander						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
WL20151104 SO2B	11/4/15 16:13	G	soil	OK Brn soil some gravel		Ra 226, Ra 228, Iso 232, Ino Th, Gross Alpha Gross Beta Pb 210
WL20151104 SO2C	11/4/15 16:18	Duplicate	soil	OK Brn soil		"

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 5, 2015 Arrival Time: 10:05 Departure Time: 10:50						
Team members/responsibilities: <div style="display: flex; justify-content: space-between;"> <div> Dan Carey 2x2, sample Ritz Alexander observation, sample </div> <div> Tom Mehler, EPA joined during sampling. </div> </div>						
Weather (Description) Cloudy lt. Rain	Temperature: 64°F	Humidity: 77%	Wind: (Direction and Speed) SE @ 7 mph			
Radiation detection equipment used: model/serial number/calibration:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015 8K-11K						
Time:	1018	10:20	10:22	10:30	10:33	
Reading:	10084	10436	11812	8604	8488	
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015 5-10 nR/hr						
Range of Readings:						
Sample Collection Log Information						
Sample location description: S04 Virbec						
Odors Present: Yes or No		If Yes Please Describe: Very mild Transfer station odor				
Collection equipment: slide hammer & spirit level sampled with sieve						
Sampler's name(s): Dan Carey Ritz Alexander						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
WLL20151105 S04	11/5/15 10:40	Grab	Soil	OK Soil Sample		Pb 210, Pb 228, Iso 234, Iso Th, Gross Alpha Beta, Pb 210

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: <u>November 5, 2015</u> Arrival Time: <u>11:05</u> Departure Time: <u>11:25</u>						
Team members/responsibilities: <div style="display: flex; justify-content: space-between;"> <div> DAC (Dan Carey) > observe RSA (Rita Alexander) </div> <div> TM, EPA - 3x3 shield @ SPZ S- Tom Mahrer </div> <div> Cpm { 12K cpm General area 10 K cpm - sample location </div> </div>						
Weather (Description) <u>cloudy</u> <u>lt. Rain</u>	Temperature: <u>66</u> F	Humidity: <u>69</u> %	Wind: (Direction and Speed) <u>S</u> @ <u>13</u> mph			
Radiation detection equipment used: model/serial number/calibration:						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings:						
Sample Collection Log Information						
Sample location description: <div style="display: flex; justify-content: space-between;"> <div> SPZ Revisit w EPA TM Perform Directional counts in area of </div> <div> 3x3 (with shield) </div> <div> Checked sample SPZ - no shield Nothing else - not enough vol Gen area 25K Found elev. readings near SPZ w 30% elev. </div> </div>						
Odors Present: Yes or <u>No</u>			If Yes Please Describe:			
Collection equipment: <u>NA: MetEPA: Discrimination & observations only</u>						
Sampler's name(s): <u>NA</u>						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
<u>None</u>						

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 5, 2015 Arrival Time: 1130 Departure Time: 1205						
Team members/responsibilities: Don Carey Tom Mahler EPA Rita Alexander						
Weather (Description) It Rained	Temperature: 68°F	Humidity: 69%	Wind: (Direction and Speed) S @ 13 mph			
Radiation detection equipment used: model/serial number/calibration:						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings:						
Sample Collection Log Information						
Sample location description: EPA unshielded Readings - 3x3 Revisit: NA S10 Gravel - 18K cpm S10 loc sample 36-39K cpm Dredge 30-31K cpm Waste 25-34K cpm (E side of PL)						
Odors Present: Yes or No			If Yes Please Describe:			
Collection equipment: EPA NA Observation & Discussion only Photos taken						
Sampler's name(s): NA						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
None						

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 5, 2015 Arrival Time: 12:10 Departure Time: 12:55						
Team members/responsibilities: <div style="display: flex; justify-content: space-between;"> Don Carey 202 Sample Rita Alexander Sample observe </div>						
Weather (Description) lt. Rain		Temperature: 69 F		Humidity: 69 %		Wind: (Direction and Speed) S @ 13 mph
Radiation detection equipment used: model/serial number/calibration:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:		12:20	12:23	12:25	12:27	
Reading:		10957	11600	10988	10805	
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input checked="" type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings:						
Sample Collection Log Information						
Sample location description: <div style="display: flex; justify-content: space-between;"> SD9 SW corner of AAA PL Sample taken in low area near NW corner of area 2 near base of 1st level Rd. </div>						
Odors Present: Yes or No			If Yes Please Describe:			
Collection equipment: slide hammer & split spoon sampler with sleeve						
Sampler's name(s): Don Carey Rita Alexander						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
WV6285105 - SD9	11/5/15 12:30	G	soil	DK Brn soil		Ra 226, Ra 228, Th 232, Th 230, Pb 210

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 5, 2015 Arrival Time: 13:39 Departure Time: 14:10						
Team members/responsibilities: DAC sampler 2x2, Gills (Don Carey) EG sampler, Photo (Eric Gilstrap) RA sampler, Observer 2x2 (Eric Alexander)						
Weather (Description) lt. Rain	Temperature: 67F		Humidity: 78%		Wind: (Direction and Speed) S @ 10 mph	
Radiation detection equipment used: model/serial number/calibration:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:	13:43					
Reading:	9442					
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings:						
Sample Collection Log Information						
Sample location description: Parked @ SS Heavily Veg Dirt adjacent to St. Charles Rd & Area 2 Across from Jimmy Johns Dig is Between SCLL & Area 2 DAC EG entered Veg Area @ 13:33 to loc the area for 1 min Reading (2x2) & Sample Gamma solution - Not Pos. Due to heavy Veg!						
Odors Present: Yes or No		If Yes Please Describe: Mild - Mod - Transfer/Mannure odor				
Collection equipment: Shovel hammer 5x12 spoon sampler with sleeve						
Sampler's name(s): DAC / RJA / EG DAC sampler, 2x2 EG sampler, Photos RJA sampler, Observations						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
WLW20151105 - SP3	11/5/15 13:45	Soil Grass	Soil			Ra 226, Ra 228, Th-230, Th-232, U-235, U-238, Pu-239, Pu-240, Pu-241, Am-241, Cm-247, Cm-248, Cm-249, Cm-250, Cm-251, Cm-252, Cm-254, Cm-255, Cm-256, Cm-257, Cm-258, Cm-259, Cm-260, Cm-261, Cm-262, Cm-263, Cm-264, Cm-265, Cm-266, Cm-267, Cm-268, Cm-269, Cm-270, Cm-271, Cm-272, Cm-273, Cm-274, Cm-275, Cm-276, Cm-277, Cm-278, Cm-279, Cm-280, Cm-281, Cm-282, Cm-283, Cm-284, Cm-285, Cm-286, Cm-287, Cm-288, Cm-289, Cm-290, Cm-291, Cm-292, Cm-293, Cm-294, Cm-295, Cm-296, Cm-297, Cm-298, Cm-299, Cm-300, Cm-301, Cm-302, Cm-303, Cm-304, Cm-305, Cm-306, Cm-307, Cm-308, Cm-309, Cm-310, Cm-311, Cm-312, Cm-313, Cm-314, Cm-315, Cm-316, Cm-317, Cm-318, Cm-319, Cm-320, Cm-321, Cm-322, Cm-323, Cm-324, Cm-325, Cm-326, Cm-327, Cm-328, Cm-329, Cm-330, Cm-331, Cm-332, Cm-333, Cm-334, Cm-335, Cm-336, Cm-337, Cm-338, Cm-339, Cm-340, Cm-341, Cm-342, Cm-343, Cm-344, Cm-345, Cm-346, Cm-347, Cm-348, Cm-349, Cm-350, Cm-351, Cm-352, Cm-353, Cm-354, Cm-355, Cm-356, Cm-357, Cm-358, Cm-359, Cm-360, Cm-361, Cm-362, Cm-363, Cm-364, Cm-365, Cm-366, Cm-367, Cm-368, Cm-369, Cm-370, Cm-371, Cm-372, Cm-373, Cm-374, Cm-375, Cm-376, Cm-377, Cm-378, Cm-379, Cm-380, Cm-381, Cm-382, Cm-383, Cm-384, Cm-385, Cm-386, Cm-387, Cm-388, Cm-389, Cm-390, Cm-391, Cm-392, Cm-393, Cm-394, Cm-395, Cm-396, Cm-397, Cm-398, Cm-399, Cm-400, Cm-401, Cm-402, Cm-403, Cm-404, Cm-405, Cm-406, Cm-407, Cm-408, Cm-409, Cm-410, Cm-411, Cm-412, Cm-413, Cm-414, Cm-415, Cm-416, Cm-417, Cm-418, Cm-419, Cm-420, Cm-421, Cm-422, Cm-423, Cm-424, Cm-425, Cm-426, Cm-427, Cm-428, Cm-429, Cm-430, Cm-431, Cm-432, Cm-433, Cm-434, Cm-435, Cm-436, Cm-437, Cm-438, Cm-439, Cm-440, Cm-441, Cm-442, Cm-443, Cm-444, Cm-445, Cm-446, Cm-447, Cm-448, Cm-449, Cm-450, Cm-451, Cm-452, Cm-453, Cm-454, Cm-455, Cm-456, Cm-457, Cm-458, Cm-459, Cm-460, Cm-461, Cm-462, Cm-463, Cm-464, Cm-465, Cm-466, Cm-467, Cm-468, Cm-469, Cm-470, Cm-471, Cm-472, Cm-473, Cm-474, Cm-475, Cm-476, Cm-477, Cm-478, Cm-479, Cm-480, Cm-481, Cm-482, Cm-483, Cm-484, Cm-485, Cm-486, Cm-487, Cm-488, Cm-489, Cm-490, Cm-491, Cm-492, Cm-493, Cm-494, Cm-495, Cm-496, Cm-497, Cm-498, Cm-499, Cm-500, Cm-501, Cm-502, Cm-503, Cm-504, Cm-505, Cm-506, Cm-507, Cm-508, Cm-509, Cm-510, Cm-511, Cm-512, Cm-513, Cm-514, Cm-515, Cm-516, Cm-517, Cm-518, Cm-519, Cm-520, Cm-521, Cm-522, Cm-523, Cm-524, Cm-525, Cm-526, Cm-527, Cm-528, Cm-529, Cm-530, Cm-531, Cm-532, Cm-533, Cm-534, Cm-535, Cm-536, Cm-537, Cm-538, Cm-539, Cm-540, Cm-541, Cm-542, Cm-543, Cm-544, Cm-545, Cm-546, Cm-547, Cm-548, Cm-549, Cm-550, Cm-551, Cm-552, Cm-553, Cm-554, Cm-555, Cm-556, Cm-557, Cm-558, Cm-559, Cm-560, Cm-561, Cm-562, Cm-563, Cm-564, Cm-565, Cm-566, Cm-567, Cm-568, Cm-569, Cm-570, Cm-571, Cm-572, Cm-573, Cm-574, Cm-575, Cm-576, Cm-577, Cm-578, Cm-579, Cm-580, Cm-581, Cm-582, Cm-583, Cm-584, Cm-585, Cm-586, Cm-587, Cm-588, Cm-589, Cm-590, Cm-591, Cm-592, Cm-593, Cm-594, Cm-595, Cm-596, Cm-597, Cm-598, Cm-599, Cm-600, Cm-601, Cm-602, Cm-603, Cm-604, Cm-605, Cm-606, 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Cm-732, Cm-733, Cm-734, Cm-735, Cm-736, Cm-737, Cm-738, Cm-739, Cm-740, Cm-741, Cm-742, Cm-743, Cm-744, Cm-745, Cm-746, Cm-747, Cm-748, Cm-749, Cm-750, Cm-751, Cm-752, Cm-753, Cm-754, Cm-755, Cm-756, Cm-757, Cm-758, Cm-759, Cm-760, Cm-761, Cm-762, Cm-763, Cm-764, Cm-765, Cm-766, Cm-767, Cm-768, Cm-769, Cm-770, Cm-771, Cm-772, Cm-773, Cm-774, Cm-775, Cm-776, Cm-777, Cm-778, Cm-779, Cm-780, Cm-781, Cm-782, Cm-783, Cm-784, Cm-785, Cm-786, Cm-787, Cm-788, Cm-789, Cm-790, Cm-791, Cm-792, Cm-793, Cm-794, Cm-795, Cm-796, Cm-797, Cm-798, Cm-799, Cm-800, Cm-801, Cm-802, Cm-803, Cm-804, Cm-805, Cm-806, Cm-807, Cm-808, Cm-809, Cm-810, Cm-811, Cm-812, Cm-813, Cm-814, Cm-815, Cm-816, Cm-817, Cm-818, Cm-819, Cm-820, Cm-821, Cm-822, Cm-823, Cm-824, Cm-825, Cm-826, Cm-827, Cm-828, Cm-829, Cm-830, Cm-831, Cm-832, Cm-833, Cm-834, Cm-835, Cm-836, Cm-837, Cm-838, Cm-839, Cm-840, Cm-841, Cm-842, Cm-843, Cm-844, Cm-845, Cm-846, Cm-847, Cm-848, Cm-849, Cm-850, Cm-851, Cm-852, Cm-853, Cm-854, Cm-855, Cm-856, 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Cm-982, Cm-983, Cm-984, Cm-985, Cm-986, Cm-987, Cm-988, Cm-989, Cm-990, Cm-991, Cm-992, Cm-993, Cm-994, Cm-995, Cm-996, Cm-997, Cm-998, Cm-999, Cm-1000

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 5, 2015 Arrival Time: 8:5:03 Departure Time: 17:30						
Team members/responsibilities: EG - Samples RA - Observations, samples						
Weather (Description) lt. Rain	Temperature: 66 F	Humidity: 83%	Wind: (Direction and Speed) S @ 12 mph			
Radiation detection equipment used: model/serial number/calibration:						
<input checked="" type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:		16:00				
Reading:		9800				
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings:						
Sample Collection Log Information						
Sample location description: Drainage way in woods S of WLL... SØ6						
Odors Present: Yes or <u>No</u>		If Yes Please Describe:				
Collection equipment: Slide hammer + split spoon w/ sleeve						
Sampler's name(s):						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	GPS Coord.	Analytes Requested & Preservative if used
WLL 2015 1105 - SØ6	11/5/15 16:00	05 Grab Soil	Soil/ Sed	Dr Brw Soil/ Sed.		Rad U, Ra 226, Tm 232, Tm 234, Gross Alpha, Gross Beta
WLL 2015 1105 - WØ1	11/5/15 17:00	Grab	Surface Water	Dr Gray Water		Total U, Ra 226, Ra 228, Gross Alpha, Gross Beta
WLL 2015 1105 - WØ2	11/5/15 17:00	Field Drip	Surface Water	"		Total U, Ra 226, Ra 228, Gross Alpha, Gross Beta

S08

Sample Event Log Information						
Project : West Lake Landfill Vicinity Sampling Event						
Sampling & Analysis Plan: West Lake Landfill Radiological Survey and Sampling Plan, November 3, 2015						
Purpose: Sample and Data Collection						
Date: November 6, 2015 Arrival Time: 15:15 Departure Time: 16:10						
Team members/responsibilities: Eric Gilstrap						
Weather (Description) Sunny	Temperature: 60 F	Humidity: 37 %	Wind: (Direction and Speed) from SE @ 4.6 mph			
Radiation detection equipment used: model/serial number/calibration: NW						
<input type="checkbox"/> Ludlum Model 2221 & 44-10 Detector/218595 & PR231843/October 20, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 2221 & 43-5 Detector/156999&PR155892/August 8, 2015						
Time:						
Reading:						
<input type="checkbox"/> Ludlum Model 19A/ 201916/June 25, 2015						
Range of Readings:						
Sample Collection Log Information						
Sample location description: Drainage path discharge location from SW wooded area into lake bordering Lakefront Drive properties						
Odors Present: Yes or No (circled No) If Yes Please Describe:						
Collection equipment: Split Spoon lake						
Sampler's name(s): See Team Members						
ID Number	Sample Date/Time	Sample Type	Sample Matrix	Sample Descript.	UTM GPS Coord.	Analytes Requested & Preservative if used
WLL20151106S08	Nov 6, 2015 15:45	GRAB	SED/Soil		0721,437 4,293,913	ISO U, Iso Th, Ra-226, Ra-228 Gross α , Gross β

Appendix E: MDNR Meteorological Data

Bridgeton Sanitary Landfill Hourly Average Meteorological Data

Date and Hour	Avg. Temp. (Degrees F)	Avg. Wind From (Directional Degrees)	Avg. Wind From (Cardinal Direction)	Avg. Wind Speed (Miles per Hour)	Avg. Relative Humidity (Percent)
11/4/2015 10:00	64.02	196.00	SSW	2.91	79.97
11/4/2015 11:00	65.77	176.00	S	3.54	75.38
11/4/2015 12:00	68.23	165.00	S	3.63	70.07
11/4/2015 13:00	70.19	152.00	S	2.68	66.48
11/4/2015 14:00	72.33	144.00	SE	3.52	62.31
11/4/2015 15:00	70.32	148.00	S	4.05	67.13
11/4/2015 16:00	68.82	147.00	S	3.72	71.68
11/4/2015 17:00	66.80	142.00	SE	2.44	77.56
11/4/2015 18:00	65.94	146.00	SE	2.45	80.70
11/4/2015 19:00	66.77	156.00	S	4.41	77.52
11/4/2015 20:00	66.45	166.00	S	4.00	76.87
11/4/2015 21:00	67.55	170.00	S	4.13	69.37
11/4/2015 22:00	67.55	174.00	S	5.18	67.88
11/4/2015 23:00	67.38	179.00	S	4.48	65.28
11/5/2015 0:00	66.99	173.00	S	3.49	64.26
11/5/2015 1:00	65.55	160.00	S	1.97	65.86
11/5/2015 2:00	63.53	150.00	S	1.93	70.78
11/5/2015 3:00	65.07	195.00	SSW	4.25	67.72
11/5/2015 4:00	64.12	154.00	S	2.33	70.79
11/5/2015 5:00	61.72	156.00	S	2.00	77.73
11/5/2015 6:00	62.00	155.00	S	2.77	80.12
11/5/2015 7:00	62.84	145.00	SE	2.94	79.93
11/5/2015 8:00	64.70	164.00	S	5.82	76.83
11/5/2015 9:00	66.56	180.00	S	6.79	74.69
11/5/2015 10:00	67.43	172.00	S	5.08	74.17
11/5/2015 11:00	67.53	183.00	S	4.79	76.21
11/5/2015 12:00	65.88	192.00	SSW	5.57	84.84

Bridgeton Sanitary Landfill Hourly Average Meteorological Data

Date and Hour	Avg. Temp. (Degrees F)	Avg. Wind From (Directional Degrees)	Avg. Wind From (Cardinal Direction)	Avg. Wind Speed (Miles per Hour)	Avg. Relative Humidity (Percent)
11/5/2015 12:00	65.88	192.00	SSW	5.57	84.84
11/5/2015 13:00	65.65	182.00	S	6.23	86.68
11/5/2015 14:00	65.75	176.00	S	5.50	86.92
11/5/2015 15:00	64.99	170.00	S	7.91	89.05
11/5/2015 16:00	64.81	173.00	S	7.19	89.80

Appendix F: Field Book Notes

2

11/4/2015

0830 Arrive @ EER Trailer

Team: Rita H.; Don C.; Eric G.; Ryan S.

9:50 Spanish Village Park
Present: Tom EPL

(cem)

Dust swipes D04 A } Test @ cem
" B } Alpha using
" C } Control 2221

11:05 D04C Both Intakes above electric meter

10:55 Alpha testing on Jungle Gym - ~~0~~
(inside crawl space to slide facing pavilion)

Office @ 12:00

Split Group:

Dust: Eric, Ryan

Soil: Rita, Don

3

12:50 D05 Around MSD
Lift station

12:11 Micro R/hr

GPS #089 mark elev: 188 m
#090 mark N 38° 45.797
W 090° 26.817

D05A MSD Lift Station control panels
1300 under shelter - micro R/hr @ S

D05B Box under air monitor -
1315 micro R/hr @ ~ 7-12

#091 Mark N 38° 45.795
W 090° 26.776

range ~ 5-10

13:33 House

13:35 Picnic Tables D03 A

#094 mark N 38° 45.690
W 090° 26.448

micro R/hr @ ~ 7-13

13:42 DØ3B Piano inside house

13:50 DØ2 Abandoned gas station
Micro R/hr range ~7-15

14:05 DØ2A-1 Mark #95
N 38°45.766
W 090°26.123

14:15 DØ2A-2 "

14:25 DØ2B
Trash barrel south of BLDG
Alpha test on trash barrel (Ludlum 2221) cpm

DØ1 EER Trailer

14:47 DØ1A Oven hood (Inside)
Alpha Ø cpm Insignificant

14:50 DØ1B Printer Shelf (Inside)
Alpha Ø-22 cpm Insignificant

14:55 DØ1C Floor (Inside)
Alpha Ø-17 cpm Insignificant

16:30 DØ6 13374 Lakefront Dr.
Micro R/hr range ~8-13
No swipe areas

17:00 AAA Trailer Mark #9C

DØ7A N 38°46.291
(pinna) radiation sign W 090°27.020

Micro R/hr range ~8-15

8

Alpha test on sign ϕ

depart EER Trailer @ 18:00

11/4/15 0625 West Lake Landfill Vicinity Sampling

Arrived @ Hussian Trailer w Eric Gilstrap

Met with OPR Personnel Adam Urbas.

EG 2nd & signed off on BHASP.

Weather: cloudy, foggy, 59°F, 93% humidity, wind S @ 5 mph

DHS staff arrived @ 7:15

EPA staff present: Tom Mahler

Cell #

DHS: Steve May, Will Brantly, Shawn Adams, Mark, Jennifer

Keith Hinkle

Cell #

Randy Moley, Lovitt Harris Franklin, Cory Jorgensen

Melissa Reynolds, Nick Rasmussen, Jeremy Wilson

Jonathan Gervette, Rich Campbell

Arrived @ Hussian 2nd time @ 7:30

Met Ryan Seabough & Tom Mahler.

Began sample Rt @ 9:45

Drove for lunch @ 14:30 - 1500

Ended day @ approx 18:00 & left area for

Minimant Field Office

Wk completed - All swipe samples &

Soil samples from locs. S05, S01, S02 &

S04 & S10. All notes kept on field log.

Prior to work. Equipment check were performed

Before & After Sampling Day.

Results kept in equipment log

Book.

11/5/15 West Lake Landfill Vicinity Sampling

2nd day WLL Vicinity Sampling

Arrived @ Florissant Field office @

8am to prep for sampling.

left Florissant office w Dan Carey
for 1st loc @ N 0930.

1st loc SP4 @ Vibree. Met w Berry

Miller @ Vibree to gain Access.

weather: cloudy, lt. rain, 64°F, 77% humidity

Tom Mauer, wind SE @ 7 mph.

EPA joined us while @ Vibree

I followed us to Area ^{SP13} SP2 (Arthur Truening)

+ SP10; SP9 - AAA Trucking Parking lots.

~~They~~ ^{we} observed our sample loc &
conducted some scans with their
3x3 radiation detection equipment.

Aaron Schmitt & several people with the
AGO & SWMP joined us briefly while @
AAA, and left around 12:00. Dan Carey

I resumed sampling @ 12:00 with Scan &
soil sampling @ SP9. Eric Gilstrap joined
us @ 13:15 & assisted in collecting sample
@ SP3 in ditch across St. Charles Rte Rd
from Jimmy Johns. 14:15-15:00: we broke for

lunch. Eric Gilstrap & I continued ^{soil & surface} sampling
@ ^{the loc} SP6, finishing & leaving area @ 17:30.

RJ

84 11/16/15

Arrived @ 12:30 EPA Fenton, MO

Met Tom Mahler, EPA. Began QC check on
Ludlum
3030 equipment with lead shielding

"A" Th 230 check source 19,100 dpm 12/1/03

SN#: 5158-03 DNS-4

EPA SN# 0768-5023

"B" Sr 90 check source 5,510 dpm 12/2/03

SN#: 5156-03 DNS-14

EPA #: 770-3427

Th 230 C.S. 1mm $CF = 3291 \text{ cpm} = 17\% \text{ eff.}$

Sr 90 C.S. 1mm $CF = 9 = 1198 \text{ cpm} = 22\% \text{ eff.}$

Native average counts in cpm

10min BG count = 0 (A) 442 (B) cpm

For α : Alpha β : Beta

10min
Began CB @ 13:08 of 10L samples

DØ4A: $\alpha = 0$ $\beta = 45$ cpm

DØ1D: $\alpha = 0$ $\beta = 43$ cpm

DØ5A: $\alpha = 0$ $\beta = 43$ cpm

DØ7A: $\alpha = 1$ $\beta = 48$ cpm

LI

3030 was calibrated by Ludlum 12/5/14

It is due for recalibration on 12/5/15

Serial # = 191249

Completed counts @ 14:15

Left EPA Fenton office @ 14:30

Rgn